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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/880,757	06/15/2001	Kiyotaka Wasa	35.C15462	5938

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FITZPATRICK CELLA HARPER & SCINTO
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

EXAMINER	
TUGBANG, ANTHONY D	

ART UNIT	PAPER NUMBER
3729	

DATE MAILED: 06/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/880,757	WASA ET AL.	
	Examiner	Art Unit	
	A. Dexter Tugbang	3729	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *73-85* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *73-85* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/16/04 has been entered.

Election/Restrictions

2. Upon further consideration by the examiner, the previous restriction requirement (in the Office Action, dated 12/16/03) has been withdrawn. All of Claims 73-85 will be examined on their merits. There would be no burdensome search to examine Claims 84-85 along with Claims 73-83.

Information Disclosure Statement

3. The information disclosure statement filed 4/20/04 fails to comply with 37 CFR 1.98(a)(1), which requires a list of all patents, publications, or other information submitted for consideration by the Office. However, the reference of the Official Letter (English Translation of an Official Letter in Korean Patent Application 10-2001-0035451) has been considered and has been cited by the examiner in the attached PTO-892 Form.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 73, 74, 76-81 and 83-85 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moynihan et al 5,500,988 in view of Roeder et al 5,719,417.

Regarding Claim(s) 73 and 84, Moynihan discloses a method of manufacturing a piezoelectric element comprising: forming on a support substrate 10 (in Fig. 1), a layer or first layer (bottom PZT layer 3 in Fig. 1) having a perovskite structure and a second layer (anyone of PZT layers 3 above the bottom "first layer") having a perovskite structure and zirconium (see col. 1, lines 14-16); forming the first and second layers to 800 °C with both layers having amounts of zirconium (see col. 4, lines 31-37); and cooling from the formation temperature of 800 °C to normal room temperature (see col. 3, lines 29-42). The range of cooling of Moynihan, i.e. from 800 °C to normal room temp., overlaps the claimed range of "at least to 450 °C". The cooling speed of Moynihan can be calculated to approximately 1560 °C/min, which satisfies the claimed speed of "at least 30 °C/minute".

Regarding Claim(s) 74, the claimed "intermediate layer" can be read as anyone of the PZT layers 3 of Moynihan in-between the selected first and second layers.

Regarding Claim(s) 79-81, the claimed "piezoelectric film" of Moynihan can be read as either the first or second layers 3 with each being formed of zirconium in a layer thickness range

of 1-25 μm (see Claim 1), which overlaps the claimed ranges of the piezoelectric film as recited in each of Claims 79-81.

Regarding Claim(s) 83, the limitations of claim 83 are very similar to the limitations of Claim 73 with the exception of the claimed "element for preventing crystallization growth during a thin film process". The claimed "element for preventing crystallization growth during a thin film process" (line 6) is alternatively read as the material of zirconium in Moynihan.

Regarding Claim(s) 85, Moynihan further teaches that the substrate is heated along with the temperature of the layer or first layer (see col. 3, lines 29+). Thus, the heating temperature is the temperature of the supporting substrate.

Moynihan does not mention that a layer is formed by a vapor method (as required by Claim 84), or does not mention that both the first layer and the second layer are formed by a vapor method with the first layer containing either no zirconium or an amount of zirconium less than the second layer (as required by Claims 73 and 83).

Roeder teaches a PZT forming process of forming a layer, or first layer, of a pervoskite structure (seed layer 37 in Fig. 3), then subsequently forming a second layer (PZT layer 40 in Fig. 4), which is also of a pervoskite structure, by a vapor method of chemical vapor deposition. The first layer is formed of a composition without any zirconium (PLT) and the second layer is formed of a composition including zirconium (see col. 4, line 65 to col. 5 line 5 and col. 6, lines 9+). Within this vapor method of vapor deposition, both the first and second layers are heated at a time of formation above 500°C (see col. 7, lines 28-35).

Regarding Claim(s) 76, 77 and 78, Roeder suggests that the piezoelectric film (either one of layers 37 or 40) can have a monocrystal lattice structure of either a (100), or a (111) orientation (see col. 7, lines 65+ and Fig. 12).

The benefit of the above PZT forming process of Roeder positively allows control of the orientation of the layers of the piezoelectric element during operation (see col. 1, lines 31-49). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Moynihan by utilizing the PZT forming process of Roeder by forming one of the layers without zirconium, to advantageously control the orientation of the layers of the piezoelectric element.

6. Claim 75 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moynihan et al in view of Roeder et al, as applied to claim 73 above, and further in view of EP'165.

Moynihan, as modified by Roeder, discloses the claimed manufacturing method as previously discussed. The modified Moynihan method does not teach the ratio of zirconium/titanium.

EP'165 teaches at least one example of a zirconium/titanium ratio of 50/50 (see col. 8, lines 54-56). The advantage of the EP'165 manufacturing process provides high piezoelectric characteristics with thin piezoelectric films (see col. 2, lines 8-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the method of Moynihan by including the ratio EP'165, to advantageously provide high piezoelectric characteristics with thin piezoelectric films.

7. Claim 82 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moynihan et al in view of Roeder et al, as applied to Claim 73 above, and further in view of Dawson et al 5,453,262.

Moynihan, as modified by Roeder, discloses the claimed manufacturing method as previously discussed. The modified Moynihan method does not teach that the second layer contains niobium, tin and manganese.

Dawson teaches that material selection of a PZT for a piezoelectric film can include the specific materials of niobium, tin and manganese (see col. 4, lines 28-34) as this material selection would inherently provide antiferroelectric characteristics. The selection of the above materials alternative forms a perovskite structures (see col. 3, lines 5+).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the material of the second layer of Moynihan by including the material selection of Dawson, to achieve an art recognized equivalent perovskite structure.

Response to Arguments

8. Applicant's arguments filed 3/16/04 have been fully considered, but are now considered to be met and fully inclusive within the new grounds of rejection set forth above.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Dexter Tugbang whose telephone number is 703-308-7599. The examiner can normally be reached on Monday - Friday 7:00 am - 3:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Vo can be reached on 703-308-1789. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A. Dexter Tugbang
Primary Examiner
Art Unit 3729

June 21, 2004